GLASGOW MECHANICS' INSTITUTION,

(In Union with the Society of Arts, London.)

SESSION 1863-64.

CHEMISTRY. By Dr. WALLACE, F.C.S.

On TUESDAY EVENINGS, at HALF-PAST EIGHT o'Clock, for Six Months. INTRODUCTORY LECTURE, TUESDAY, 27th OCTOBER.—*FEE, Four Shillings.*

NATURAL PHILOSOPHY,

By Mr. THOMAS JOHNSTON, Surgeon.

On FRIDAY EVENINGS, at HALF-PAST EIGHT o'Clock, for Six Months. Introductory Lecture, FRIDAY, 30th OCTOBER. FEE for both Courses, with Library for One Year, *Eight Shillings;* for the Half-Session, *Four Shillings.* For either Course alone, with Library for Six Months, *Four Shillings;* or for Twelve Months, *Six Shillings.* Students holding Tickets for either of the above Courses are Members of the Institution while they hold such Tickets.

THEORY AND PRACTICE OF MUSIC,

By Mr. SAMUEL BARR,

On THURSDAY EVENINGS, at HALF-PAST EIGHT o'Clock, for Six Months. Introductory Lecture, THURSDAY, 29th OCTOBER. *FEE, Four Shillings,* with Library during the Course.

ANIMAL PHYSIOLOGY,

By Mr. JOHN MAYER, F.C.S.

On WEDNESDAY EVENINGS, at a QUARTER-PAST EIGHT o'Clock, for Six Months. Introductory Lecture on WEDNESDAY, 28th OCTOBER. *Fee, Four Shillings,* with Library during the Course.

ELEMENTARY CLASS FOR

PRACTICAL MECHANICS,

By Mr. J. P. SMITH, C.E.

On MONDAY EVENINGS, at HALF-PAST EIGHT o'Clock, for Six Months. Introductory Lecture on MONDAY, 2d NOVEMBER. *FEE, Four Shillings,* with Library during the Course.

Ladies' and Apprentices' Tickets, Two Shillings for each of the above Courses.

ELOCUTION,

By Mr. HARCOURT BEATTY (BLAND.)

On MONDAY EVENINGS, at HALF-PAST EIGHT o'Clock, for Six Months. Introductory Lecture on MONDAY, 2d NOVEMBER. *Fee, Six Shillings,* with Library during the Course.

ADDITIONAL EVENING CLASS FOR

FRENCH,

By Monsieur DUTOIT.

Commencing on TUESDAY, the 29th SEPTEMBER.

INITIATORY—TUESDAY and THURSDAY, from 8 till 9 Evening.
ADVANCED, " " " 9 " 10 "

FEE, for Session of Six Months, Fifteen Shillings.

INTRODUCTORY LECTURES FREE.

THE FOLLOWING CLASSES ARE IN PROGRESS, AND OPEN FOR THE ENROLMENT OF STUDENTS.

ARITHMETIC, ALGBERA, & MATHEMATICS,

By Mr. H. M. ASHCROFT.

JUNIOR CLASS, on MONDAY and WEDNESDAY, from 8 till 10 Evening, FEE, 6s. per Quarter.

ADVANCED " —(Embracing the more Advanced Books of Euclid, the higher Rules of Algebra, Analytical Trigonometry, Analytical Geometry, and the Differential and Integral Calculus), on TUESDAY and THURSDAY, from 8 till 10 Evening,.....FEE, 7s. 6d. per Quarter.

MECHANICAL DRAWING,

By Mr. PETER STEWART, Mechanical Draughtsman,

On TUESDAY and THURSDAY, from 8 till 10 Evening. FEE, Six Shillings per Quarter.

DRAWING, PAINTING, & ARCHITECTURE,

By Mr. A. D. ROBERTSON, Artist.

On WEDNESDAY and FRIDAY, from 8 till 10 Evening. FEE, Six Shillings per Quarter.

English Grammar, Composition, and Literature,

By Mr. R. B. SMITH.

JUNIOR, on MON., WED., and FRID., from 8 till 9 Evening. FEE, Six Shillings per Quarter.
SENIOR, " " " 9 till 10 " " " "

MORNING AND EVENING CLASSES FOR

WRITING, ARITHMETIC, & BOOK-KEEPING,

By Mr. JOHN M'GREGOR.

MORNING CLASSES, on TUESDAY, THURSDAY, & SATURDAY, - from 7 till Half-past 8 o'Clock.
EVENING CLASSES, on TUESDAY, THURSDAY, & FRIDAY, - - from 8 till 10 p.m.
FEE FOR WRITING AND ARITHMETIC, - - - Six Shillings per Quarter.
Do. Do. Do. AND BOOK-KEEPING, Seven Shillings & Sixpence per Quarter.

MORNING & EVENING CLASSES FOR FRENCH.

By Monsieur DUTOIT.

MORNING CLASSES. { Initiatory—TUESDAY, THURSDAY, & SATURDAY, from $6\frac{3}{4}$ till $7\frac{3}{4}$ o'Clock.
Advanced— Do. Do. Do. from $7\frac{3}{4}$ till $8\frac{3}{4}$ o'Clock.

FEE, NINE SHILLINGS per Quarter.

EVENING CLASSES. { Initiatory—MONDAY, WEDNESDAY, & FRIDAY, from 8 till 9 o'Clock.
Advanced— Do. Do. Do. from 9 till 10 o'Clock.

FEE, NINE SHILLINGS per Quarter.

MORNING & EVENING CLASSES FOR GERMAN,

By HERRN WILHELM REHBANN.

MORNING CLASSES. { Junior—TUESDAY AND THURSDAY, - - from 7 till 8 o'Clock.
Advanced—Do. Do. - - from 8 till 9 o'Clock.

EVENING CLASSES. { Junior—TUESDAY AND THURSDAY, - - from 8 till 9 o'Clock.
Advanced—Do. Do. - - from 9 till 10 o'Clock.

FEE, NINE SHILLINGS per Quarter.

LATIN & GREEK,

By Mr. JOHN MILLAR, A.M.

MORNING CLASS, for ELEMENTARY LATIN, on TUESDAY, THURSDAY, & SATURDAY, at 7 o'Clock.

EVENING CLASSES. { GREEK— MONDAY, WEDNESDAY, & FRIDAY, from 7 till 8 o'Clock.
JUNIOR LATIN— Do. Do. Do. from 8 till 9 o'Clock.
SENIOR Do. Do. Do. Do. from 9 till 10 o'Clock.

FEE, SEVEN SHILLINGS and SIXPENCE per Quarter.

SPANISH,

By Mr. ARCHD. REVIE.

On TUESDAY and FRIDAY—JUNIOR, from Eight till Nine. SENIOR, from Nine till Ten, Evening.

FEE, TEN SHILLINGS and SIXPENCE per Quarter.

DANCING & PHYSICAL IMPROVEMENT,

By Mr. D. SINCLAIR,

Commencing on MONDAY, 5th October.

DAY CLASSES, - - - - on Monday, Wednesday, and Friday, from 12 till 6 p.m.
EVENING CLASSES, for Ladies only. - - - do. do. from 7 till $8\frac{1}{4}$
SELECT PUBLIC CLASSES, - - - do. do. from $8\frac{1}{4}$ „ 10

FEE, for each Class for Session of Four Months, TWENTY-ONE SHILLINGS.

Fee for the Library, for Six Months, to Students attending any of the Classes, Two Shillings

DAY CLASSES

For all the branches of a first-class liberal Education are in full operation, and pupils can be enrolled a any time, being charged only from date of Entry.

TICKETS to be obtained from Mr. Paton, Institution Rooms, 38 Bath Street; from Members of Committee; Mr G. Gallie, 99 Buchanan Street; Messrs. T. Murray & Son, 49 Buchanan Street; Mr. John Galletti, 34 Argyle Arcade; Mr. Morison Kyle, 108 Queen Street; Mr. White, 1 Renfield Street; and Mr. John P. Russell, 184 Trongate, *where outlines of the Courses may be had Gratis.*

The Mutual Instruction Class, Open to the Members of all the Classes, will recommence at the Beginning of the Session.

SYLLABUS,

SESSION 1863-64.

CHEMISTRY,

By Dr. WALLACE.

In the present Session, the lectures on CHEMISTRY will treat of the Fundamental Principles of the Science, together with the history of the Non-Metallic Elements.

This Course will be particularly adapted to those about to commence the Systematic Study of Chemistry. The lectures will be profusely illustrated by Experiments, Diagrams, Apparatus, and Specimens.

Examinations will be held from time to time to test the proficiency of the Students, and award prizes. Attendance on these examinations is voluntary.

INTRODUCTORY LECTURE.—THE CORRELATION OF THE PHYSICAL FORCES.

PART I.—CHEMICAL PHYSICS, AND THE FUNDAMENTAL PRINCIPLES OF THE SCIENCE. The General Properties of Matter—Cohesion, Adhesion, and Capillary Attraction—Crystallisation and Crystallography—Specific Gravity—The Physical Constitution of the Atmosphere—The Laws of Chemical Combination—Atomic Theory—Chemical Notation and Nomenclature—Heat, Light, and Electricity, in relation to Chemical Science.

PART II.—THE NON-METALLIC ELEMENTS, AND THEIR COMPOUNDS. Oxygen, Ozone—Hydrogen, Water—Nitrogen, nitric acid, protoxide of nitrogen or laughing gas, Ammonia—Carbon, the diamond, charcoal, and graphite; Carbonic Acid and Carbonic Oxide, Hydrocarbons, including Fire Damp, Olifiant Gas, Benzole, Paraffin, &c.; Coal Gas, its manufacture and properties, Cyanogen, Hydrocyanic or Prussic Acid—Boron, Boracic Acid and Borax—Silicon, Silicic Acid or Silica, Silicate of Soda, Artificial Stone—Sulphur, Sulphurous Acid, Sulphuric Acid or Oil of Vitriol, Sulphuretted Hydrogen, Sulphide of Carbon—Selenium and Compounds—Phosphorus, Oxide of phosphorus, Phosphorous Acid, Phosphoric Acid, Phosphoretted Hydrogen—Chlorine, Bleaching, Hypochlorous Acid, Chloric Acid and Chlorate of Potash, Hydrochloric Acid—Iodine, Kelp, Hydriodic Acid—Bromine—Fluorine, Hydrofluoric Acid, Fluoride of Silicon, Etching on glass—The Chemistry of the Atmosphere.

NATURAL PHILOSOPHY.

By THOMAS JOHNSTON, ESQ., SURGEON.

INTRODUCTION.—General view of the Subjects of the Course.

MATTER.—General and Specific Properties—Extension—Impenetrability—Divisibility—Inertia, &c.

MOTION AND FORCE.—Direction of Motion; Laws of Motion—Composition and Resolution of Motion—Composition and Resolution of Forces—Terrestrial Gravity—Centre of Gravity—Centrifugal Forces.

MECHANICS—Simple Machines—Lever—Wheel and Axle—Pulley—Inclined Plane, &c.—Regulation and Accumulation of Force—Effect of Fly Wheel—Resisting Forces—Effects of Friction—Mechanical Agents—Wind—Water—Animal Forces.

MECHANICAL PROPERTIES OF LIQUIDS.—Liquid Pressure—Hydrostatic Paradox—Levelling—Floating Bodies—Buoyancy—Specific Gravity—Hydrometers—Liquids in Motion—Syphon—Intermitting Springs—Water Wheels—Barker's Mill.

MECHANICAL PROPERTIES OF AIR.—Weight—Elasticity—Compressibility—Height of Atmosphere—Barometer—Air-Pump—Air-Gun—Machines for Raising Water—Diving Bell.

HEAT.—Sources—Effects—Measures of Heat—Thermometers—Conduction—Radiation—Combustion—Ventilation—Animal Heat.

ANIMAL MECHANICS.

THEORY AND PRACTICE OF MUSIC,

By Mr. SAMUEL BARR.

The Members of this Class will commence their studies by acquiring a knowledge of Rythm, or Regulated Time in Music, its varied character, and its effects upon the ear and mind, creating diversified feelings and sensations. Tone, the various qualities usually found in the human voice, Guttural, Nasal, Sombre, Clear, &c., how these are produced, and how to avoid the bad and acquire the good. The inherent character and tendencies of each of the seven degrees of the scale, with their effects upon the ear. The different characters used in the ordinary notation, along with the other departments of the Theory, will be given in an attractive form, and only when they are to be put into immediate practice. The principal aim in the exercises given, will be to enable the student to sing at sight written Music, and the practice of which is peculiarly adapted for the education of the ear and the voice in Time and Tune. Selections of Psalm Tunes, Anthems, Glees, and the most popular Songs of the season, will be given as practice on the lessons acquired, rendering the Course a source of recreation and pleasure.

During the present Session, a short time will be set apart each night, for the purpose of forwarding advanced students in a knowledge of the Theory and Practice of Harmony, and preparing them to compete for the prizes offered by the Society of Arts, London.

The first part of a book, on the Theory and Practice of Harmony, has been published for this department.

ANIMAL PHYSIOLOGY.

By Mr. JOHN MAYER, F.C.S.

I.—General Principles of Physiology.

Division of Natural Bodies into three groups, *Minerals*, *Vegetables*, *Animals*—These examined and contrasted in respect of Form, Structure, Chemical Composition, &c.—The terms "Organ," "Organization," and "Function" defined and illustrated—Forces affecting Living Bodies—Elementary and Proximate Composition of Living Bodies—Structure and Properties of Animal Tissues—Division of Functions into *Organic* and *Animal*—Their respective organs contrasted—General view of Animal Kingdom.

II.—Organs and Functions of Animal Life:

Part First.

The Human Body viewed as a Locomotive Apparatus—Bones: their Structure, Mode of Growth, and Uses—Joints: their Varieties and Modes of Action—Ligaments—Muscular System—General and Microscopic Structure, and Distribution of the two varieties of Muscle—Tendons—Mode of Action of Muscles—Animal Mechanics.

III.—Organs and Functions of Organic Life.

Why the Living Organism wastes—Why Food is necessary—Food of Plants and that of Animals contrasted—Nature, Sources, and Chemical Composition of the chief substances forming the Food of Man.

Digestion.—Why necessary—How performed in the Human Organism—Teeth, their Development, Structure, Number, &c.—Structure of organs forming Saliva, Gastric Juice, Pancreatic Juice, Bile, and Uses of these Secretions—Absorption of Nutritious Products of Digestion.

Circulation.—Characters and Composition of Human Blood—Coagulation of the Blood—Course and Mechanism of Circulation in Man and other Animals.

Respiration.—Why necessary—Composition of the Air, and Chemical Properties of its ingredients, experimentally illustrated—Aquatic and Aërial Breathing—Mechanical and Physical Principles involved in performance of Function of Respiration in Man—Ventilation.

Excretion.—Nature and Use of Function—Excretion of Carbonic Acid, Water, and Azotized Compounds by the Lungs, Skin, and Kidneys—Structure and Mutual Relations of these organs.

Animal Heat.—Its Conditions and Sources—The Circulatory System viewed as a Hot-water Warming Apparatus.

IV.—Organs and Functions of Animal Life:

Part Second.

Nervous System.—Structure and Functions of Nervous Matter—Offices of Brain and Spinal Cord—Spinal Nerves—Structure and Functions of their Anterior and Posterior Roots—Reflex Action—Common Sensation—Structure, Mode of Action, and Peculiarities of organs of Special Sense: the Skin, Nose, Tongue, Eye, Ear—Voice and Speech, and the organs concerned in their performance.

V.—REPRODUCTION.

REPARATIVE PROCESSES.—*Local*, as exhibited in the Reproduction of lost parts, Healing of Wounds, &c.; *General*, as shown in the Reproduction of the Individual—Reproduction in Plants and Animals—Hereditary Transmission of Disease or other Peculiarities of Parents.

DEATH.—Nature of Death—Difference between *Local* and *General* Death—Moulting, Shedding of Skin and Teeth, Sloughing and Mortification—Usual commencement of Death in Nervous Centres, Heart, or Lungs.

CONCLUSION.

The Lectures on PHYSIOLOGY will be as familiar and popular as is consistent with the subject, and will be thoroughly illustrated by means of Preparations, Casts, Diagrams, &c., and by frequent demonstrations by the Microscope.

In addition to the weekly Lectures, Class Examinations will be held, both oral and written, at least once a fortnight, with the object of testing the progress made from time to time, and of preparing those students who may wish to compete at the Examinations in PHYSIOLOGY, to be held in April and May next respectively, by the Society of Arts, and the Government Department of Science and Art, for the Prizes and Certificates awarded by the former, and for the National Medals and Queen's Prizes awarded by the latter. During the three years that the Science and Art Department Scheme of Examinations has been in operation, Mr. Mayer's students have gained 39 Queen's Prizes in addition to 3 National Medals awarded for success in the Examinations in ANIMAL PHYSIOLOGY.

Ladies may join this Class with the greatest of propriety, as the instruction to be imparted during the Session will be suitable alike for both sexes.

PRACTICAL OR APPLIED MECHANICS.

By J. P. SMITH, C.E.

The purpose of the present Course of Lectures is to impart a knowledge of the Science of Mechanics, and its practical application to structures and machines. Part of the course will be specially devoted to a discription of "Prime Movers," and explanations of the scientific principles of their action.

The Lectures throughout will be illustrated by reference to the most important parts of structures and machines; and exercises having a practical bearing will regularly be proposed to the students for solution.

INTRODUCTORY LECTURE.

FORCES IN ONE PLANE.—Forces acting on a point in one line—Forces acting on a point in different lines—Parallelogram of forces—Triangle of forces—Polygon of forces—Composition and Resolution of forces (Geometrically)—Application of Trigonometry—Rectangular Resolution—Principle of Moments—Parallel forces—Couples.

FORCES ACTING ON A POINT IN LINES WHICH DO NOT LIE IN ONE PLANE.—Lines of Reference—Specification of position—Rectangular Co-ordinates—Direction and Magnitude of Resultant, &c., &c.

FORCES ACTING ON A RIGID BODY.—Equilibrium of a rigid body, under inclined forces, parallel forces, couples.

CENTRE OF GRAVITY.

STRENGTH OF MATERIALS.—*Nature of stress to which materials are subjected*—Thrust, or pressure—Tension, or pulling asunder—Shearing, or Tangential stress—*Capability of various materials to withstand stress.*

THEORY OF STRUCTURES.—*Stability*—Equilibrium and stability of frames—Parts of a frame, Beams, Struts, Ties—Equilibrium under inclined and parallel forces—*Strength and stiffness*—Single rivetted overlapped joints—Double rivetted overlapped joints—Single rivetted butt joints—Double rivetted butt joints—Boilers, Pipes, Tubes (resistance to bursting, collapsing, and crushing)—Action of load on beam, supported at one end and loaded at the other, supported at one end and uniformly loaded, supported at both ends and loaded in the middle, supported at both ends and uniformly loaded—supported at both ends and loaded in any manner—Shearing forces—Bending moments—Proportioning of various kinds of beams, struts, and ties.

MACHINES IN EQUILIBRIUM—Simple Machines.

The Lever,
The Inclined Plane,
The Cord,
} The principles of action, and application, in various forms.

FRICTION, STATICAL AND DYNAMICAL.

PRINCIPLES OF CINEMATICS, OR THE COMPARISON OF MOTIONS.—Translation—Simple Rotation—Components of Velocity of a point in a rotating body—Rotation combined with translation in the same plane—Reciprocating motions—Illustrations by connecting rods—Paralell motion—Link motion, &c., &c.

Motions of cords and pliable bodies over pullies, blocks, &c.

Motions of fluids in streams, currents, channels, pipes, and jets.

WHEEL WORK.—General principles—Methods of construction, form of teeth, &c.—Plane wheels—Spur wheels—Rack and Pinion—Bevel wheels—Crown wheels—Annular wheels—Trains of wheel work, &c.

PRINCIPLES OF DYNAMICS.—Work—Unit of Work—Measure of Work—Inertia—Momentum—Impulse—Energy—Potential Energy—Actual Energy—Total Energy—Consenation of Energy—Transformation of Energy—Motion of a falling body—Moment of Inertia of a rotating body—Radius of Gyration, &c.

THEORY OF MACHINES.—Efficiency—Useful and last work—Mean efforts and resistances—Friction of Machines—Friction of Sliding Pieces—Friction of Axles—Friction of a Pivot—Friction of Teeth of Wheels—Friction of Bands—Fluctuation of Speed—Regulation of Speed—Unquents.

HEAT.—The Economy of Fuel—Slow and Forced Combustion—Concentration of Heat—Prevention of Smoke.

STEAM.—Generation of Steam—Working of Steam at low pressures, high pressures, expansively.

BOILERS.—Arrangement and proportions of Furnaces—Flues—Heating Surfaces—Hemispherical Boiler—Waggon-shaped Boiler—Cylindrical Boiler—Cylindrical Boiler, with middle flue—Boiler with double flues—Tubular Boilers.

STEAM ENGINES.—Low pressure, or Condensing Engines—High pressure Engines—Combined high and low pressure Engines—Stationary Engines—Portable Engines—Marine Engines—Locomotive Engines.

WATER POWER.—Overshot and Breast Wheels—Undershot Wheels—Turbines—Hydraulic Ram—Hydraulic Press, &c., &c.

ELOCUTION & ORATORICAL GESTICULATION,

By Mr. HARCOURT BEATTY (BLAND),

Professor of the Art, and late Histrionic Artist of Theatres-Royal London, Dublin, Edinburgh, and Glasgow.
The following will be the Subjects treated of:—

Neglect of Elocutionary Training—Absolute necessity for at least a good style of Reading, if not a good Oratorical Delivery—*Causes* of faulty Elocution (Natural and Educational)—Ordinary Elocutionary teaching at *Schools*—Injury to Pupils when erroneously instructed—The recondite and bewildering system of mere Theoretical Teachers—The true System clearly a *Simple* one, but, nevertheless, dependent upon Analytical Rules—Archbishop Whately's Essay examined, and its principles shown to be impracticable—Good reasons should be assigned for all Phonetic changes—the *true* System must be based upon *natural* laws, and be formed in obedience to Custom—Examples of faulty and correct Reading—The Lecturer's system demonstrated, with Exercises for Pupils—Principles of graceful Gesticulation—Nature and Art not antagonistic—Causes of Awkwardness—Methodical Cure possible—Illustrations and conclusion.

PRIZES.—In order to promote dilligence on the part of the Students, Prizes will be awarded to all the Classes, the particulars of which will be announced, as usual, by the Lecturers and Teachers.

BIRKBECK TESTIMONIAL.

(*Open for Competition to the Members of all the Classes.*)

In accordance with a Resolution of the Directors, that an annual Prize should be given commemorative of the eminent Services of the late Dr. Birkbeck, in behalf of Mechanics' Institutions generally, and more especially of the many and great benefits conferred by him on this Institution, they again announce a Prize, value £2 2s., to be designated the "Birkbeck Testimonial," for the best Essay on "Chemical and Mechanical Science compared, as regards their respective influence on the Progress of the Arts and Manufactures of Great Britain."

** *To preserve uniformity in size of paper, all the Essays must be written on large size post.*

The JUDGES appointed to award the Prizes for Essays or Drawings, are empowered to withhold a prize if there be no competition; or if the performance is not of sufficient merit, *the same discretionary power being allowed in case of competition.*

The Prizes will be adjudged by committees, elected partly by the Classes, and partly by the Directors of the Institution; the President and the Lecturers being judges *ex officio*. The Essays must be lodged with the Curator on or before 1st April, and all the Drawings on or before 15th April, 1864, as the Directors have resolved to adhere strictly to these dates. Each must have a motto, which motto must also be written on the outside of a sealed letter, containing inside the name and address of the author, with the Library Number of his Ticket. These letters will be kept by the Secretary till the prizes are adjudged, when those bearing the mottoes to which Prizes have been awarded will be opened in the presence of the Judges and the Committee. The others will be returned unopened to the respective competitors, when called for, within three months after the distribution of the Prizes. All the Essays gaining Prizes to become the property of the Institution.

LIBRARY.

The Directors would especially invite attention to the Library of this Institution, as one of the most valuable open to the Public. It contains upwards of 6700 VOLUMES, carefully selected, in General Literature, Science, and the Arts, and is richly furnished with Encyclopædias, Philosophical Journals, and other works of Reference. The Leading Monthly and Quarterly Periodicals are also added to the Library on publication.

ANNUAL READERS MAY JOIN THE LIBRARY AT ANY TIME. FEE, FIVE SHILLINGS.

The extensive collection of Apparatus and Models for the Illustration of the various Courses of Lectures is open for the inspection of Members and their Friends.

☞ The Institution is in connection with the Society of Arts, London; and Students are entitled, free of charge, to compete for its valuable Certificates and Prizes, and other advantages offered to Competitors.